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SWIFT Observations in the Arctic Sea State DRI

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FY13 report (year 1 of 5)

LONG-TERM GOALS

The long-term goal is to understand the role of waves and sea state in the Arctic Ocean, such that forecast models are improved and a robust climatology is defined.

OBJECTIVES

The objectives are to: develop a sea state climatology for the Arctic Ocean, improve wave forecasting in the presence of sea ice, improve theory of wave attenuation/scattering in the sea ice cover, apply wave–ice interactions directly in integrated arctic system models, and understand heat and mass fluxes in the air–sea–ice system.

APPROACH

The technical approach is to measure waves, winds, and turbulence in the Arctic Ocean using drifting SWIFT buoys [Thomson, 2012] and moored Acoustic Wave and Current (AWAC) sub-surface instruments. These measurements will be used to estimate the fluxes of momentum and heat between the air, sea, and ice. Results will be integrated with remote sensing products and wave models.

WORK COMPLETED

Work during this first year of the DRI has centered around writing an science plan that encompasses all elements of the program and details the collaborations across the various investigators. The science plan was published in September as a technical report [Thomson et al, 2013]. In addition to significant background material describing the state of the science and previous work, the document establishes the basics of a cruise plan for the 2015 field experiment. The associated UNOLS ship time request has been submitted, and work continues in defining all details of the cruise.

Also completed this year was the fabrication of two new SWIFT buoys that will be dedicated to the Sea State DRI. Several upgrades were made to the SWIFT design, including Iridium telemetry (now hourly), extended mission life (now three months), and improved wave sensor (combined IMU and GPS). A new SWIFT is shown in Figure 1.

Hull	Anodized aluminum
Power	14 VDC, Alkaline or Lithium D cell packs
Weight	30 kg in air
Dimensions	1.25 m draft, 1.0 m mast, 0.35 m diameter
Shipping crate	1.65 m length, 0.5 m width, 0.5 m depth
Endurance	20 days (Alkaline), 60 days (Lithium)
Tracking (RF)	Garmin Astro DC40 collars (10 km range)
Tracking (Iridium)	Geoforce GT1 (global)
Telemetry	Iridium SBD
Processor	Sutron Xpert
Profiler	2 MHz Nortek Aquadopp HR
Met	Airmar PB200
IMU	Microstrain 3DM-GX3-35
CT	Onset HOBO U24
Camera	serial uCAM
Light	Yellow 1s flasher

Figure 1. Newly build SWIFT buoy and specifications.

RESULTS

The result of the first year of the DRI is the integrated Science Plan and the fabrication of new SWIFT buoys.

IMPACT/APPLICATIONS

Improved sea state predictions in the Arctic Ocean will enable safe naval operations in the region.

RELATED PROJECTS

A contract with Scitor Corp. is supporting a graduate student to analyze declassified satellite images for wave information in the Beaufort region.

Resources are data are shared with the "Marginal Ice Zone" DRI. More information is at http://www.apl.washington.edu/project/project.php?id=miz

PUBLICATIONS

Thomson et al, "Science Plan for the Sea State and Boundary Layer Physics of the Emerging Arctic Ocean DRI," *APLUW Technical Report 1306*, 2013. [published]

Thomson, J. "Observations of wave breaking dissipation with SWIFT drifters," *J. Atmos. and Ocean. Tech.*, 2012. [published, refereed].